Matsusada Precision

High power & Low Noise HV Power Supplies

Ultra compact / Low noise

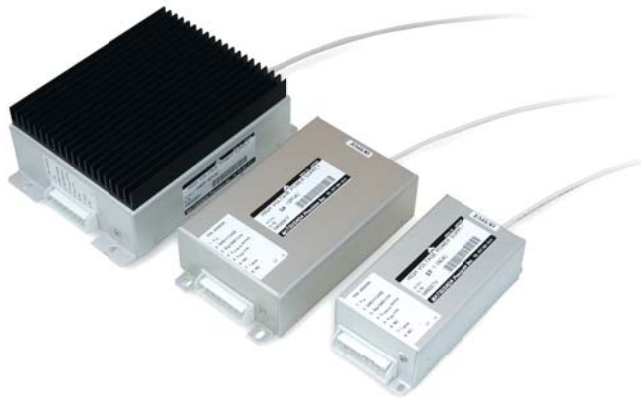
S series

0.1kV to 30kV
/1.5W to 30W

> Low noise, high stability
> Aluminum case
> Detachable input connector
> Compact and light weight
> High reliability
> Both external VR or voltage for control

APPLICATIONS

* High voltage testing
* PMT, MCP, radiation counter
* Electron Beam / Ion Beam
* MASS spectrometry
* Electrostatic chuck(ESC)



SUMMARY

The S series is a regulated, versatile, modular HV power supply used in a wide variety of applications including mass spectrometry and electron microscopes. From the OEM to the laboratory, they are an excellent choice when you require a highly stable output. Output can be controlled using either an external control voltage or external variable resistor. An optional output voltage monitor is also available. With a diverse range of models up to 30kV/30W, you will find something for nearly every requirement.

LINEUP

*P for Positive N for Negative Output Polarity.

Output Voltage (kV)	Output Current (mA)	Output Power (W)	MODEL	Ripple (%p-p)	Regulation Line (%)	Regulation Load (%)	Case
0 to 0.6	2.5	1.5	S1-0.6*	0.008	±0.005	0.005	C3B
	5	3	S3-0.6*				
	10	6	S6-0.6*				
	25	15	S15-0.6*	0.2	±0.03	0.05	C6
	50	30	S30-0.6*				C6+HS
0 to 1.1	1.4	1.5	S1-1.1*	0.005	±0.005	0.005	C3B
	2.75	3	S3-1.1*				
	5.5	6	S6-1.1*	0.008			
	12	15	S15-1.1*	0.01	±0.03	0.02	C6
	25	30	S30-1.1*	0.03			C6+HS
0 to 1.5	1	1.5	S1-1.5*	0.005	±0.005	0.005	C3B
	2	3	S3-1.5*				
	4	6	S6-1.5*	0.008			
	10	15	S15-1.5*	0.01	±0.03	0.02	C6
	20	30	S30-1.5*	0.03			C6+HS
0 to 2	0.75	1.5	S1-2*	0.005	±0.005	0.005	C3B
	1.5	3	S3-2*				
	3	6	S6-2*	0.008			
	7.5	15	S15-2*	0.01	±0.03	0.02	C6
	15	30	S30-2*	0.03			C6+HS
0 to 3	0.5	1.5	S1-3*	0.005	±0.005	0.005	C3B
	1	3	S3-3*				
	2	6	S6-3*	0.008			
	5	15	S15-3*	0.01	±0.03	0.02	C6
	10	30	S30-3*	0.03			C6+HS
0 to 5	0.3	1.5	S1-5*	0.005	±0.005	0.005	C3B
	0.6	3	S3-5*				
	1.2	6	S6-5*	0.008			
	3	15	S15-5*	0.01	±0.03	0.02	C6
	6	30	S30-5*	0.03			C6+HS

Output Voltage (kV)	Output Current (mA)	Output Power (W)	MODEL	Ripple (%p-p)	Regulation Line (%)	Regulation Load (%)	Case
0 to 6	0.25	1.5	S1-6*	0.005	±0.005	0.005	C3B
	0.5	3	S3-6*				
	1	6	S6-6*	0.008			
	2.5	15	S15-6*	0.01	±0.03	0.02	C6
	5	30	S30-6*	0.03			C6+HS
0 to 10	0.15	1.5	S1-10*	0.01	±0.01	0.01	C5
	0.3	3	S3-10*	0.02			
	0.6	6	S6-10*				
	1.5	15	S15-10*	0.02	±0.03	0.02	C6A
	3	30	S30-10*	0.03			C6A+HS
0 to 12	0.12	1.5	S1-12*	0.01	±0.01	0.01	C5
	0.24	3	S3-12*	0.02			
	0.46	6	S6-12*				
	1.2	15	S15-12*		±0.03	0.02	C6A
	2.5	30	S30-12*	0.03			C6A+HS
0 to 15	0.2	3	S3-15*	0.02	±0.01	0.01	C6
	0.36	6	S6-15*				
	1	15	S15-15*		±0.03	0.02	C6A
	2	30	S30-15*	0.03			C6A+HS
0 to 20	0.13	3	S3-20*	0.02	±0.01	0.01	C6
	0.26	6	S6-20*				
	0.75	15	S15-20*		±0.03	0.02	C6A
	1.5	30	S30-20*	0.03			C6A+HS
0 to 25	0.1	3	S3-25*	0.02	±0.01	0.01	C6
	0.2	6	S6-25*				
	0.6	15	S15-25*		±0.03	0.02	C6E
	1.2	30	S30-25*	0.03			C6E+HS
0 to 30	0.08	3	S3-30*	0.02	±0.01	0.01	C6A
	0.16	6	S6-30*				
	0.5	15	S15-30*		±0.03	0.02	C6E
	1	30	S30-30*	0.03			C6E+HS

SPECIFICATIONS

Input Voltage/Current

Model	Input Voltage	Input Current(typ.)	
		up to 6kV	10kV to 30kV
S1	+12Vdc±1V	380mA	410mA
S3	+24Vdc±5%	330mA	360mA
S6		500mA	550mA
S15		1A	
S30		2A	

Output Voltage Control S1,S3,S6 : By external potentiometer 5kΩ or external control voltage(Vcon-in 0 to 6Vdc)
S15,S30 : By external potentiometer 5kΩ or external control voltage(Vcon-in 0 to 3Vdc)

Line Regulation See table
(S1 : at maximum voltage for ±1V input line change)
(S3,S6,S15,S30 : at maximum voltage for ±5% input line change)

Load Regulation See table(at maximum voltage for 0 to 100% load change)

Stability S1,S3,S6 : 100ppm/Hr
S15,S30 : 200ppm/Hr

Protection Overload, arc & short circuit protected

Temperature Coef. 80ppm/°C

Input terminal 8 pin connector
Mating connector and pins are assorted
(Recommendations :
wire for pin ①, ② are AWG18
wire for pin ③ to ⑧ are AWG22 to 18)

Output Cable HV flying lead 50cm(1.6 feet)
When more than 25cm is required specify the length.
<e.g.>S1-3P(output cable 1m)

Temperature range Operating : 0 to 50°C
Storage : -20 to 60°C

Humidity 20 to 80%RH(no condensation)

Monitor Voltage(option) and current monitor.
See the table on page 8 for details.

Linearity Within ±0.5% of control voltage versus output voltage.
Residue voltage when Vcon 0V is within 0.3%.

OPTIONS

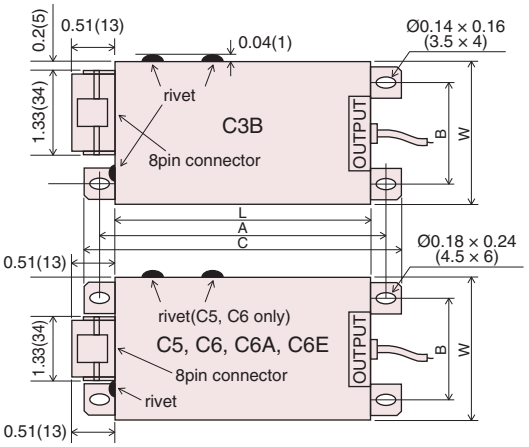
-LW Slow start

-L2 Voltage Monitor Output
up to 6kV : 1V/@1kV
10k to 30kV : 1V/@10kV
Accuracy ±2.5% F.S.

See the table on page 08 for details
Add "-LW" "-L2" to the Model number at time of order.
(i.e. S1-6P-L2)

CN8R Assembled input connector (accessory)
(connector with 25cm flying leads)

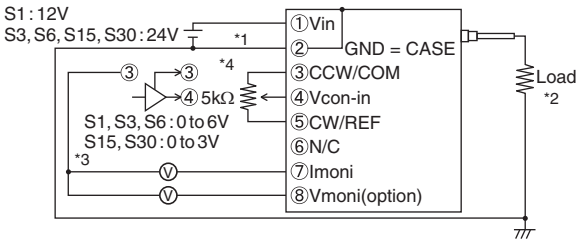
DIMENSIONS inch(mm)



Case	A	B	C	W	L	H
C3B	3.86 (98)	1.57 (40)	4.17 (106)	1.97 (50)	3.58 (91)	1.22 (31)
C5	4.72 (120)	1.97 (50)	5.12 (130)	2.76 (70)	4.33 (110)	1.26 (32)
C6	5.12 (130)	2.76 (70)	5.51 (140)	3.94 (100)	4.72 (120)	1.38 (35)
C6A	6.69 (170)	2.76 (70)	7.09 (180)	3.94 (100)	6.3 (160)	1.5 (38)
C6E	7.68 (195)	3.54 (90)	8.07 (205)	4.72 (120)	7.28 (185)	1.69 (43)

* Please add 0.51(13) to H for models with +HS case.

CONNECTION DIAGRAM



*1 GND pin ② must be properly grounded
*2 Return line from the load must be connected to GND pin ②
*3 Input impedance of Vcon-in pin ④ is ≧30kΩ
*4 Potentiometer of T.C ≦100PPM/°C, PC ≧ 1/4W is recommended

OUTPUT MONITOR

Output value of Voltage(option) / Current monitor

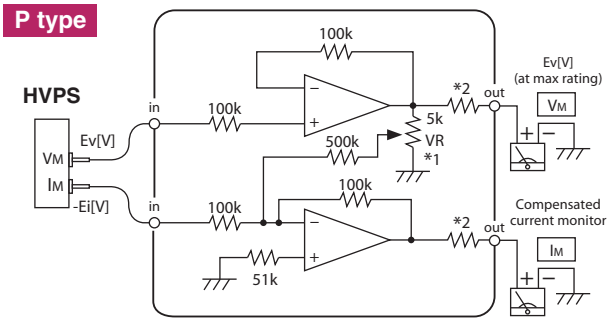
- Polarity of V monitor is same as that of HV output.
- Input current increase by 10 to 20% when V monitor(option) is added.
- Polarity of current monitor is negative for P type(+), and positive for N type(−).
- Current monitor output has off set voltage proportional to output voltage.
- Use voltmeter with input impedance more than 10MΩ to measure Voltage / Current monitor.

MODEL	Output voltage Vo(kV)	0.6	1.1	1.5	2	3	5	6	10	12	15	20	25	30
S1 S3 S6	I monitor	1V/@10mA	1V/@1mA						1V/@100μA					
	V monitor (option)	1V/@1kV							1V/@10kV					
S15 S30	I monitor	1V/@10mA	0.3V/@1mA			1V/@1mA			0.3V/@100μA				1V/@100μA	
	V monitor (option)	1V/@1kV							1V/@10kV					

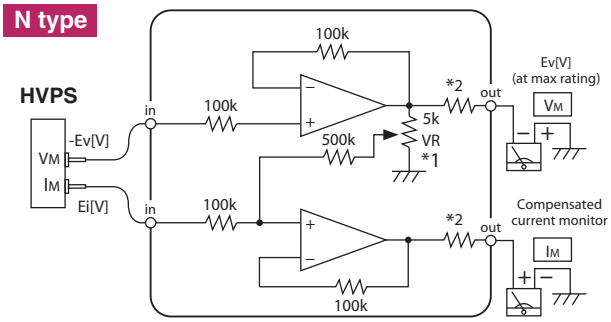
Application note: Compensation and amplification circuit of current monitor

Current monitor of S series is a simple monitor mainly for detecting output short circuit and has offset voltage.
Voltage monitor is just buffer AMP. Circuit of current monitor deduct current over voltage detecting resistor inside.

P type



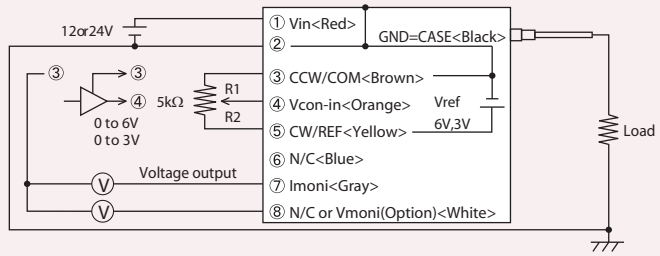
N type



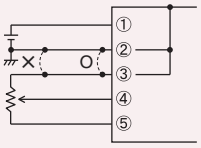
*1) At maximum output voltage, set I_M to be 0V without load. * Power supply of OP-AMP is ±15V.
*2) Place resistors so that meter become full scale at rated output. (not required when using digital meter)

OPERATION

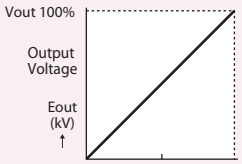
[Connection diagram]



·Left diagram shows the connection inside. Vref is divided by R_1 and R_2, and output voltage is determined by voltage input to④.
·When lead wire connected to③④⑤is 30cm or longer, or when noise from environment is large, use two-core shielded cable to shield with pin③.
·For variable resistor use metal film variable resistor or multi-turn potentiometer.

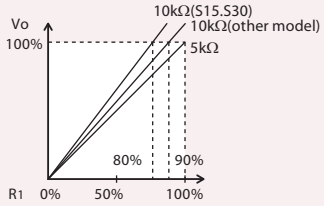


② GND and③COM are tied together inside, but do not short them outside. When connected with long wire the load regulation will be larger.
If need to short them, do it at close to power supply (O of above fig.)



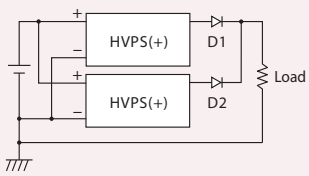
Vcon	0	3	6V(S1, S3, S6)
	0	1.5	3V(S15, S30)
R1(Ω)	0	2.5k	5k
R2(Ω)	5k	2.5k	0

Output voltage can be controlled by varying control voltage or resistor.



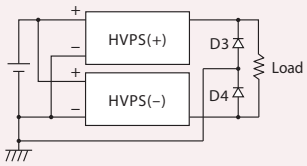
Value of external variable resistor is 5kΩ 10kΩ resistor can be used, but output will be about 10% (20% for S15, S30) higher against dividing ratio. Do not use resistor of below 5kΩ or over 10kΩ.

[Parallel operation]
(Increase output current)



·Put diodes, otherwise output of either unit will not increase.
·Inverse dielectric voltage of D1, D2 shall be more than output voltage.
·Connect P type(+) an N type(-) of same series.

[Dual tracking operation]



·Inverse dielectric voltage of D3, D4 shall be more than output voltage.
·Connect P type(+) an N type(-) of same series.

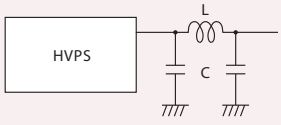
Operation Notes

· Do not touch the HV output cable right after turning off the power supply because there might be residue voltage. Make sure the voltage is 0V before touching the output.
· Make sure to ground the GND terminal, pin②, for extra safety, although this series is designed with various safety features as built-in type HV module.
· Avoid continuous short circuit.

OUTPUT RIPPLE

Switching frequency of S series is about 20kHz to 50kHz. If ripple (noise or hum) of different frequency is shown, it might be from outside. Have another solution like keep away from noise source.

[Reduce output ripple]

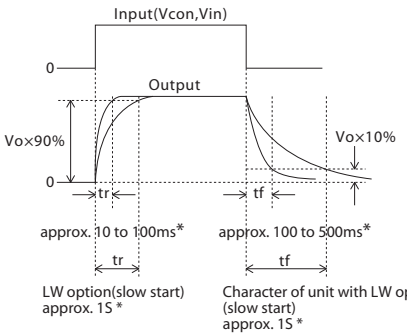


L is about 1mH to 10mH.
C is about 0.001μF to 0.1μF.
(Check the rated voltage)

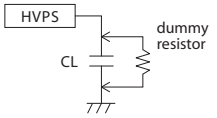
RESPONSE

Typical value at rated load

tr : Rise time
tf : Fall time



tr,tf shall be slow with capacitive load. A dummy resistor shall work for quick fall time.



FAX

USA/canada : 1-888-652-8651

other countries : 1-81-77-561-2112

Customer Inquiry Sheet (HV modules)

Please copy this page and above fax number after filling out form below.

■ I would like

☐ A quotation ☐ An explanation of product ☐ A demonststration ☐ To purchase

☐ Other ( )

■ Give us your requirement / comment

■ Please fill in below.

Address:	
Company:	
Dept.:	Title:
Name:	
Tel:	Fax:
E-mail:	

Warranty

We warrant that products contained in this catalog (hereinafter, the “Products”) are free from defects in material and workmanship under normal use for a period of one (1) year from the date of shipment thereof. However, the warranty period for X-ray detectors and X-ray source shall be either one (1) year from the date of shipment or 1,000 hours, whichever shorter.The above warranty shall not apply to any Product which, at our sole judgment, has been:i)Repaired or altered by persons unauthorized by us; or ii)Connected, installed, adjusted or used otherwise than in accordance with the instructions furnished by us (including being used in an inappropriate installation environment, such as in corrosive gas, high temperature and humidity). We are not liable for any loss, damage or failure of the Products after the shipment thereof caused by external factors such as disasters.If any Product is showed to be defective as satisfactory to us, we, at our sole discretion, repair or replace such defective Products at no cost to the purchaser.We assume no liability to the purchaser or any third party for special, incidental, consequential, or other damages resulting from a breach of the foregoing warranty. This warranty excludes any and all other warranties not set forth herein, express or implied, including without limitation the implied warranties of merchant-ability or fitness for a particular purpose. The Products are not designed and produced for such applications as requiring extremely high reliability and safety, or involving human lives (such as nuclear power, aerospace, social infrastructure facility, medical equipment, etc.). The use under such environment is not covered by this warranty and may require additional design and manufac-turing processes.

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